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Embedding a unit on environmental education into a fourth-grade curriculum

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Embedding a Unit on Environmental Education into a Fourth-grade Curriculum

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Signature Page

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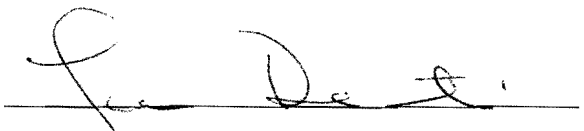
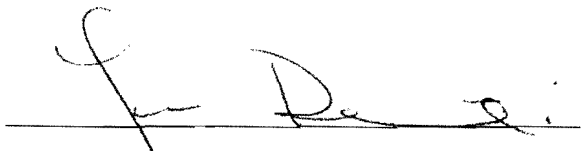


Louis Denti, Ph.D., Advisor — Date: 5-14-2014



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Observe the lilies of the field, not even Solomon in all his splendor was clothed as one of these (Luke 12:27). Do not hinder the little children, for the kingdom of heaven belongs to such as these (Matthew 19:14).

EMBEDDING A UNIT ON ENVIRONMENTAL EDUCATION
INTO A FOURTH-GRADE CURRICULUM

Abstract

This research project integrated environmental education into the school curriculum so that elementary school students could learn about the responsible use, protection, and enjoyment of the natural environment. This project utilized four learning stations on campus as outdoor classrooms - a native plant garden, an organic vegetable garden, a vermiculture compost site, and the school ground itself - in order to ascertain the efficacy of embedding this approach in a fourth-grade science curriculum. Students' responses on a post-project open-ended questionnaire revealed that students were interested in appreciative interactions with the natural world as sources of joy and understanding. Students were interested in stewardship of natural resources for reasons ranging from helping the earth, helping individual plants and animals, and helping people; to dealing with issues of recycling and littering. Students' responses on a post-project closed-ended questionnaire indicated that: most students agree with preserving and conserving the natural world, and being stewards of the natural world; most students want to have a rewarding and positive relationship with the natural world; most students are in support of recycling and are opposed to littering. Teachers' responses on a post-project open-ended questionnaire revealed that after my project, students are more likely to engage in appreciative interactions with the natural world but only somewhat more likely to engage in stewardship of the natural world. An environmental education specialist's responses on a post-project open-ended questionnaire and my reflective teaching journal provided insights that overall, my project and my teaching were good and beneficial, in relation to my project goals. However, there is need for improvement in the area of professional development as a formal educator. Further, though appreciative interactions with the natural world were stressed in my project, stewardship of natural resources could have been stressed more.

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CHAPTER 1

Introduction

The advent of high-stakes testing and narrowed curriculum has further contributed to environmental education in school curriculum being a rare event. Environmental education is often thought of synonymously with science. Though the natural world's beauty and splendor emanate from the natural sciences, appreciation and enjoyment must be explained and inspired by the teacher. As Goleman, Bennet, and Barlow (2012) indicate; education, preservation, appreciation, and ecology are central tenets of eco-literacy, which deals with creating an awareness of our impacts on the natural world and how to live more harmoniously with the natural world. For example, school gardens can enhance curricular work, promote environmental stewardship, and engage students socially and academically (Cutler, 2011). According to Russell (1973), the schoolyard can serve as an outdoor education site. For this thesis, my goals reach beyond utilizing the schoolyard itself, they include utilizing a plant garden, a vegetable garden, and a vermiculture compost site.

A unique aspect of this thesis project end product will be to provide teachers with a detailed framework that crosses content subject areas and integrates curriculum. The framework will be state standard's based and in concert with Common Core standards. Teachers can utilize my framework, teach students what they need to be taught, and promote environmental stewardship in a non-competitive outdoor setting. This connects them to the natural world in a very direct, positive, and personal way at the school and in the classroom.

The natural world accepts all living things to the fullest extent of equality and equity; it affords all people equal access and opportunity. For example, it does not view or distinguish

between class, gender, physical endowment, or race. The outdoor classroom environment in this research project creates an opportunity structure wherein students explore the natural world in a non-competitive cooperative manner. Dyment and Bell (2007) alleged that green areas promoting light to moderate activities rather than rigorous activities are more open to students who are physically challenged and those of a more gentle nature. Some or many of these students who are not interested in competition are strong in the area of intelligence Gardner (1999) titles "naturalistic". These students are more attuned to the natural world, have a more passive and nurturing nature, and are highly observant. Green area activities such as gardening create environments with less gender isolationism and geographic separation (Dyment and Bell, 2007; Evans, 2001). Environmental justice and social justice go hand in hand (Chawla, 1999).

Problem Statement

Environmental education inspires children to more greatly appreciate and enjoy the natural world. Environmental education creates real opportunities for students to participate in service learning projects at school or in the community; it may even lay a foundation for future employment prospects in the green industry. Environmental education actively engages students in elementary school classrooms, thus increasing the likelihood for higher achievement in science, math, and language arts.

Unfortunately, environmental education is not embedded in most school's curriculum and cash strapped school districts have allocated minimal funds to support environmental education. This contributes to children growing up more and more disconnected to and separate from the natural world (Louv, 2008). According to (Dyment and Bell, 2007; Dyment and Reid, 2005), the loss of the natural world in our children's lives is unhealthy for our children physically, mentally, and spiritually. Along with lack of funding for environmental education, there has been a paradigm shift with a focus on high-stakes tests. This reduces educational opportunities for students and relegates teachers and students to highly scripted reading and math programs.

However, there may be a ray of hope for education at the elementary school level and environmental education in particular with the advent of the new Common Core State Standards (CCSS). The CCSS give educators more freedom to determine what topics should be covered and the way their educational goals are reached (Common Core State Standards Initiative, 2010).

There is a compelling need to provide environmental education in our schools. Therefore a meaningful environmental education experience that engages students in an active curriculum – linking the natural world to their classroom – would meet the emphasis of critical thinking that is

central to the CCSS. Moreover, the experience would be highly motivating, accenting a child's natural proclivity to explore, investigate, and solve problems.

Statement of Purpose

The purpose of this study is to determine if embedding environmental education into school curriculum inspires children to more greatly appreciate and enjoy the natural world. In this study, appreciation is measured through appreciative interactions with the natural world and conservation of natural resources. I will be working with an Elementary School on the Monterey Peninsula and successfully implanting environmental education into school curriculum. This project will be directed at 4th grade students, with energy channeled at getting them outdoors in a social, non-competitive, learning environment (Dyment and Bell, 2007). In this outdoor learning environment, students will enjoy the natural world, learn about eco-literacy, and develop environmental stewardship skills.

More specifically, students will have outdoor learning opportunities at four stations: a plant garden, a vegetable garden, a vermiculture bin, and the school yard. The curriculum will be rooted in science but be multi-faceted and applicable to all subject areas. The journal will integrate curriculum. For example, a schoolyard activity addressing science standards would be a teacher taking students, equipped with binoculars, identifying and explaining various members of local flora and fauna, and recording the information in their journal. An example of an outdoor activity addressing language arts standards would be the writing teacher taking their students out to the garden and working on haikus about the natural world (Cutler, 2007). Ideally, one activity will address multiple subjects and standards.

Methodology and data collected for this project will include a post student questionnaire, post teacher questionnaire, and personal reflective teaching journal.

Research Questions

Within the context of my action research project, I propose the following research questions:

1. How will the embedding of a unit on environmental education into a fourth-grade curriculum, in a school encompassing green space, impact the choices student's make, with respect to:
    - Appreciative interactions with the natural world (e.g., observing the behavior of a bird, observing the crystals in a rock)
    - Stewardship of natural resources (e.g., turning off un-needed lights, re-using water bottles)?
2. What will be the impact of developing and teaching a series of environmental education workshops for fourth-grade students on my own professional development as an environmental educator?

Theoretical Framework

The theoretical framework will embrace the academic contributions of three psychologists: Jean Piaget, Howard Gardner, and Robert Sternberg – each of whom have (had) extensive experience in formal education settings. The framework will center on intelligence and how it can be applied to education – specifically, eco-literacy and environmental stewardship.

Piaget was one of the preeminent thinkers and expositors on the psychology of intelligence in the early to mid-1900's. Much of his analyses delved into the cognitive and affective associations of the mind. From an environmental education perspective, it is essential that students have a handle on some eco-literacy terminology and one of the paramount goals of environmental education is to elicit feeling and emotion toward environmental stewardship.

Piaget also taught on the act of intelligence having an internal and external energy (Piaget, 1950). From an environmental education standpoint, educators strive to create an interest and effort in their students in relation to environmental stewardship – are the students *interested* in environmental stewardship? Do the students *care* about the natural world? According to Piaget (1950), intelligence is less a class of processes and more a bridge between the learner and the world around them. Moreover, along that bridge, an adaptation occurs while the learner processes their surroundings and situation. A fundamental learning point for an educator is to realize they build on what the student already knows. There is a degree of environmental literacy and appreciation for the natural world that exists in my student before I work with them. That belief system will then fuse with my teaching.

Finally, Piaget (1950) found that there is a development of mental activity in place within the learner. There are three stages to this development which I will synthesize from the context of environmental education:

- perception and habit (students must realize how connected they truly are to the natural world);
- behavior and memory (i.e., turning off lights, turning off water, not littering); and
- reasoning and thought (developing a conscious awareness of environmental stewardship in my students).

Gardner also worked extensively in the field of intelligence. Building on much of Piaget's work, he believes that by utilizing a student's intellectual strengths and weaknesses, a teacher can more effectively educate the student and nurture their abilities (Gardner, 1983). He postulates that an intelligence exists in an individual that can become highly developed. This intelligence, in turn, can lead to expert ability in that core area. Multiple Intelligences, which he groups into ten categories, usually work together, with one intelligence being capital. The ten intelligences are: linguistic, musical, logical-mathematical, spatial, bodily-kinesthetic, introverted, extroverted, existential, spiritual, and naturalistic (Gardner, 1983; Gardner, 1999). Educators in general wish to build up their student's academic profile and nurture their strengths, but now there is an even greater desire to tap into their naturalistic intelligence for the sake of environmental stewardship and student enjoyment of the natural world.

Gardner (1999) chose the term naturalistic from the root word – naturalist. "A naturalist demonstrates expertise in the recognition and classification of the numerous species – the flora and fauna – of his or her environment" (p. 48). The title naturalist is often used in harmony with the title environmental educator. However, it is not the knowledge-base which is of utmost

importance, it is the use of that knowledge to inspire conservation and preservation of the natural world.

One key facet of being naturalistic is recognizing patterns. Several environmental education activities have a component of finding and explaining patterns. Moreover, this kind of trait can be utilized across curriculum and intelligences.

Finally, in addressing ways to incorporate multiple intelligences into teaching, Gardner (1983) mentions several "focused approaches". Fusing four of these approaches with environmental education would look something like this:

- Logical (students ask themselves – if all the vegetation in an area is removed, what happens to all the animals who call that habitat their home?)
- Aesthetic (students are exposed to a beautiful natural setting)
- Hands-on (gardening and site restoration are very hands-on activities)
- Social (students are continually in a social atmosphere and working is small groups).

Around the same time Gardner was crystallizing his theory of multiple intelligences, Sternberg was solidifying his theory of the Triarchy of Thinking Abilities. As Sternberg notes, "Successfully intelligent people adapt to, shape, and select environments through a balance in their analytical, creative, and practical abilities" (Sternberg and Grigorenko, 2000, p. 6). It is the analytical, creative, and practical abilities which form the foundation of the triarchy (Sternberg and Grigorenko, 2000). If students are going to grow up and continue shaping the natural world to best meet their needs, it is of paramount importance that we environmental educators develop student's ecoliteracy. Hence, the core of this thesis – embedding environmental education into school curriculum.

From an *analytic* rationale, the first of Sternberg's triarchy, students can be taught eco-literacy to create a conscious direction of environmental stewardship. To solve existing environmental problems that humans have caused, and to insure future degradation is minimized, future citizens and policy makers must be *creative* in their thinking – the second element of the triarchy. Thirdly, students and adults must put environmental stewardship methodology into *practice* (e.g., reduce, reuse, recycle).

Finally, an outdoor classroom garden framework will be utilized to synthesis Sternberg's triarchy with environmental education:

- Analytical (Vocabulary is built by learning plant names, environmental concepts, and ecological titles. Comprehension of material is enhanced, specifically in relation to environmental stewardship. Higher level thought is achieved through direct instruction with the student and gaining their perspective.)
- Creative (Not only are students being creative in their garden setting, they are intimately creating something – life – when they plant a little plant. Moreover, the natural world is an expression of creativity and being immersed in the natural world promotes creativity.)
- Practical (The natural world has become a foreign faraway place for many children. Many people grow up believing they have no connection to or impact on the natural world. We environmental educators must teach others how connected and destructive we are to the natural world. Environmental education increases a student's appreciation for the natural world and helps students put environmental stewardship into practice.)

Jean Piaget, Howard Gardner, and Robert Sternberg have all contributed to the fields of psychology and education through a lens of intelligence. Intelligence is a combination of what is learned, how it is learned, and how it is applied. By utilizing the lens of intelligence as another teaching tool, environmental educators can more effectively inspire children to appreciate and enjoy the natural world.

Researcher Background

I was raised in the Sierra Nevada's of California, in a mixed coniferous forest, along a stream. The natural world is one of my dearest teachers and closest companions. The natural world is an affirmation of creation and a definition of beauty. I received my Associate's Degree in Liberal Studies but focused mostly on courses related to natural resources. I received my Bachelor's Degree in Natural Resources Planning, Interpretation, and Recreation. I have had naturalist experience at five National Parks – most notably, the Grand Canyon – where I was a Park Ranger in environmental education for two years. I am continually studying, learning from, enveloped in, and suffused by the natural world.

I am currently working toward a Master's Degree, with a focus on implanting environmental education into intermediate elementary school curriculum. I am working part-time with an organization dedicated to environmental education. My roles within this organization include outreach to classrooms, leadership roles on field trips, and horticulture duties. It is my career goal to be a part of inspiring people to appreciate and enjoy the natural world.

Definition of Terms

Ecology: The study of the interactions and interconnections of organisms and their environment in the natural world (Ricklefs & Miller, 2000).

Eco-literacy: Understanding humanity's interactions and interconnections with the natural world, with the aim of environmental stewardship (Goleman, 2012).

Environment as an integrating context for learning: Utilizing the natural world as an outdoor classroom (Lieberman & Hoody, 1998).

Environmental education: Education directed at environmental stewardship and knowledge of the natural world (Hawken, 2007).

Environmental stewardship: The act of caring for the natural world, maintaining an environmental ethic, conserving and preserving natural resources, and enhancing stability of ecosystems (Hawken, 2007).

Garden-based education: Teaching integrated curriculum using elements of a garden and gardening as teaching tools (Danks, 2010).

Green: Term identifying an action, person, or place of business utilizing environmentally friendly efforts and practices (Danks, 2010).

Greening: The act of bringing more natural landscapes into an area. The act of bringing more environmentally friendly practices to a place of business (Danks, 2010).

Green-space: A natural landscape within an artificial landscape (Danks, 2010).

Natural world: Any or all of the biotic and abiotic (living and non-living) individuals, collections, or systems of the earth; distinct from anything made by humanity (*in progress*).

Outdoor classroom: Utilizing the natural landscape to teach integrated curriculum (Danks, 2010).

Outdoor education: Education focused at one or more elements of the outdoors (Ibrahim and Cordes, 1993).

Outdoor recreation: Organized free-time activities where there is an interaction between the participant and the natural world (Ibrahim and Cordes, 1993).

Sustainability: A harmony between the human community and the natural world; encompassing choices, values, ethics, and interactions. Further: a utilizing of natural resources to meet human needs, in a way that minimizes impact on the natural world and considers the needs of future generations (Hawken, 2007; Primack 1995).

Transcendentalism: A belief system that the natural world is a source for spiritual joy and enlightenment (Ibrahim and Cordes, 1993).

Vermiculture: Type of composting that encourages the breaking down of organic matter with worms (Danks, 2010).

Summary

In this chapter, I introduced my master's thesis by presenting my: introduction, problem statement, statement of purpose, research questions, theoretical framework, researcher background, and definition of terms. In my next chapter, I will review the literature related to my research questions.

CHAPTER 2

Literature Review

Introduction

In this chapter, I will review the literature related to my first research question. My research questions are:

1. How will the embedding of a unit on environmental education into a fourth-grade curriculum, in a school encompassing green space, impact the choices student's make, with respect to:
    - Appreciative interactions with the natural world (e.g., observing the behavior of a bird, observing the crystals in a rock)
    - Stewardship of natural resources (e.g., turning off un-needed lights, re-using water bottles)?
2. What will be the impact of developing and teaching a series of environmental education workshops for fourth-grade students on my own professional development as an environmental educator?

This chapter will address: environmental education, its structure and function, its relationships with green space and place attachment, and some of its challenges. Intertwined within these categories is environmental education's connection to appreciative interactions with the natural world and its role in stewardship of natural resources.

Environmental Education

Being made aware that there is a problem is a crucial first step toward solving the problem. Informing people that the natural world is often defiled and abused is paramount to

raising environmental stewardship concerns. Such awareness can lead to action and positive change (Chawla, 1999; Conde & Sanchez, 2010).

Simply spending time in the natural world can form a bond with the natural world which can impact attitude and behavior and encourage stewardship (Chawla, 1999; Tarrant & Green, 1999). Indeed, being *in* a place is far more impactful than trying to form a relationship with that place from afar – standing along the rim of the Grand Canyon is more impactful than hearing a description of it (Tilden, 1957).

According to Loeffler (2004), "The outdoor environment and outdoor experiences have the potential to engage the entire person," (p. 537); meaning there is a physical, mental, emotional, and spiritual engagement. Physically, the natural world encourages full use of the senses (Louv, 2005). Mentally, immersion in the natural environment helps form a bridge of intelligence that connects the learner to their surroundings (Piaget, 1950). Emotionally, "Every little pine needle expanded and swelled with sympathy and befriended me. I was so distinctly made aware of the presence of something kindred to me" (Thoreau, pg 105, 1999). Spiritually, "Climb the mountains and get their good tidings. Nature's peace will flow into you as sunshine flows into trees. The winds will blow their own freshness into you, and the storms their energy, while cares will drop off like autumn leaves" (Muir, pg 56, 1901).

Outdoor recreation intensifies a feeling of freedom, exemplifies beauty, and stimulates thought (Ewert, Place, & Sibthorp, 2005). *How* exposure to the natural environment occurs is quintessential but *when* the exposure occurs can be equally important. According to Chawla (1999) & Ewert, Place, & Sibthorp (2005), when developing environmentally responsible behaviors, early life experiences with the outdoors is instrumental and foundational.

Children are spending less time with the natural world (Louv, 2005). Bringing the natural world into the classroom is not as effective as bringing the classroom into the natural world. Embedding environmental education into curriculum is essential in preparing our children and students for their future and maintaining a sustainable mindset toward the earth. It is far more effective to address and remedy the *causes* of the problems rather than the *consequences* of the problems. Environmental education in school curriculum can impart stewardship skills so we never find ourselves in the wake of the problems, or at least we can lessen the negative environmental impacts. Students can be taught to think proactively in designing alternative forms of development (Conde & Sanchez, 2010).

According to Kuru & Palmberg (2000), "Different environmental education programs (field trips, hiking, camps, adventure activities) aim, through personal experiences, to develop pupil's affective [(i.e., emotional)] relationships to the natural environment, their environmental sensitivity and outdoor behavior, as well as their social relationships," (p. 32).

The primary goal and end result of environmental education is and must be – stewardship of the natural world (Conde & Sanchez, 2010; Hawken, 2007; Kuru & Palmberg, 2000). Environmental education establishes a mind-set that reaches beyond the borders of the school grounds; it penetrates into a steward's everyday life, it impacts their local choices, and it has positive global influences (Conde & Sanchez, 2010).

Education is of the utmost importance in the role of directing our current and future society toward a sustainable relationship with the earth. How we view our planet and how we utilize what it offers us must become of paramount concern (Conde & Sanchez, 2010; Louv, 2005; Orr, 1994).

Structure and function of environmental education. Lawrence (2012) conducted a study in regards to student visitation to natural areas on campus and its connection to environmental stewardship. The study included one hundred fifteen college students. Lawrence found that "environmental responsibility was related to visitation frequency, and was stronger for those who had visited for a course requirement" (p. 93).

This course requirement placed an intentional path of stewardship in the life of the student and helped the pupil develop habits of conservation that will stay with them into adulthood (Chawla, 1999). According to Kuru & Palmberg (2000), "responsible environmental behavior is a learned response or action," (p. 36).

This behavior is encouraged through embedding environmental education in curriculum; these outdoor experiences are specifically created and labeled synonymously as direct, structured, and focused. These experiences are of absolute importance in cementing stewardship of natural resources into our students lives (Ewert, Place, & Sibthorp, 2005; Kuru & Palmberg, 2000). Not only are our student's thoughts developed, the attitude with which the stewardship is undertaken is enhanced and behavior is more consistent (Tarrant and Green, 1999). Further, Phipps (1988) showed in his study two more reasons why embedding environmental education in curriculum with structured experiences is more beneficial than unstructured experiences: (1) students are better able to reflect on what they are learning, and (2) educators can better assess and gain feedback.

According to Conde & Sanchez (2010), developing environmental stewardship skills to overcome and eliminate problems associated with environmental issues is not founded on case by case exposure to environmental concerns but on continual exposure through such things as embedding environmental education into school curriculum. This is an unparalleled way of

assisting the student's thoughts to lead to action (Dunlap & Heffernan, 1975). Moreover, students latch onto activities that present opportunities to take environmental action rather than activities that simply address environmental concerns (Chawla, 1999).

It's not simply exposure to the natural world that reaps rewards, the specific *type* of experience can take learning and stewardship to a higher level. Outdoor experiences that promote *appreciation* of the natural world have the most impact and lead to greater development of environmental values. Appreciative activities are of a more preservationist mentality and generate greater environmental stewardship. Appreciative activities lead to a more personal connection and a deeper level of engagement. Appreciative (i.e., bird watching) outdoor experiences or activities early in life lead to a greater environmental- responsibility belief system, while consumptive (i.e., hunting) and exploitive (i.e., down-hill skiing) outdoor experiences do not (Dunlap &Heffernan, 1975; Ewert, Place, & Sibthorp, 2005; Loeffler, 2004).

Environmental education and its relationship with green space. Schulman and Peters (2007) used Geographic Information Systems (GIS) to classify and compare 258 U.S. public elementary and middle schools in Baltimore, Boston, and Detroit. They found that the school yard, distinct from the buildings themselves, covered about 70% of the entire school grounds. Of this amount, roughly 75% was made up of turf (lawn grass) and impervious surfaces (asphalt and cement). Tree canopy cover and trees in general accounted for less than 10% of school yard area. Our authors posed that this is not an adequate level of green space – specifically in reference to trees and tree canopy cover. They back their evidence up by noting a federally mandated tree canopy cover assessment. In 1999, the United States Forest Service (USFS), in conjunction with the American Forests organization, proposed large regional tree canopy cover goals across the

nation. This goal is 25%; therefore, the 10% tree canopy cover in school yards is below the recommended level.

Greener school grounds biologically and aesthetically diversify the landscape. Dyment and Bell (2007) posed that green school grounds affect the quantity and quality of physical education. Greener school grounds facilitate more imaginative constructive open-ended play, positively nurture the spirit of the child, and promote greater student harmony. Their study involved elementary school students, teachers, parents, administrators, and 59 schools. Research was conducted at selected schools that were able to be greened; the research was then conducted at the now-greened school. Results showed that:

- 66% of students made use of the greened areas;
- greened areas were more conducive to light (e.g. garden work) to moderate (e.g. building forts) activity, rather than vigorous (e.g. basketball) activity;
- greened areas were havens for students who can't or don't want to play vigorous, often competitive activities; and
- 49% of schools responded that the greened areas promoted activity for those students who used to just 'sit on the sidelines' (Dyment & Bell, 2007).

Green areas promoting light to moderate activities rather than rigorous activities are more open to students who are physically challenged and those of a more gentle nature. Some or many of these students who are not interested in competition are strong in the area of intelligence Gardner (1999) titles "naturalistic". These students are more attuned to the natural world, have a more passive and nurturing nature, and are highly observant.

Moreover, in 2001, Evans studied a particular area of student harmony, or more appropriately, the lack thereof – bullying. He posed that improving school grounds will reduce

bullying behavior. Evans drew upon several noted authors in the field of greening school grounds and social/anti-social behavior. He encouraged administration to let the students have a hand in the greening process – both conceptually and physically. This gives students something physical and constructive to do; and gives them a sense of ownership and pride, which reduces bullying behavior. Furthermore, natural and biotic play areas, rather than artificial play structures, led to more peaceful behavior. Finally, boys and girls worked better together and didn't show such segregation and geographic isolation.

Many school grounds lack green space and are less conducive to environmental education. One way of addressing a lack of green space in a school is a community garden. Ellen Skinner, Una Chi, and Members of a Learning-gardens Educational Assessment Group (2012) conducted a study showing gardens, embedded in curriculum, are intrinsically motivating and foster engagement. The participants of the study were 310 sixth and seventh graders and their six science teachers. The model used for the study was a self-determination theory motivational model. Three key motivational areas of this model are autonomy, relatedness, and competence. The authors found that gardening:

- introduces activities that are authentic and meaningful (autonomy),
- encourages cooperation with others (relatedness), and
- addresses problem solving (competence) (Skinner et al., 2012).

Moreover, "of greatest interest was the correlation between the two respondents' reports of student engagement, …in the current study, the correlation between teacher and student reports of student engagement in the garden was indeed positive and significant" (Skinner et al., 2012, p. 26-27).

Cutler (2011) developed a teaching garden in Princeton Day School which acted as an outdoor classroom and enhanced curricular work. The garden curriculum advanced eco-literacy and was embedded in science, language arts, and social studies. If someone is to green a school and establish an embedded EE curriculum, they would do well to address three aspects of the school: the facilities, the curriculum, and the institutional behavior; she noted that it was also exceedingly important to make allies and partners at the school and in the community.

Furthermore, according to Dyment & Reid (2005), a successfully greened school administration encourages focusing on eco-literacy for the students and environmentally friendly school operation. The school would do well to divide eco-friendly school operations into four components: waste minimization, energy conservation, environmental education curriculum, and school ground greening. Research showed that all four components were interwoven.

Finally, Lieberman and Hoody (1998) organized the concept that using the natural environment as an integrating context for learning (EIC) will produce engaged and productive students. Though there is a strong sense of environmental understanding and stewardship, the EIC model was not designed only to encourage environmental awareness. The EIC was designed to help students learn about their field of interest/class work, by embracing the natural world and their local community. One group of 14 schools stated that quantitative evidence supported academic achievement. Another group of 5 schools stated that EIC students caused fewer discipline problems. The study looked at eight areas of curriculum, in all of which, students showed benefits to EIC. For example:

- In science (99% of students showed increased knowledge and understanding, 99% of students were better able to apply what they learned, and 98% of students showed greater enthusiasm and interest.)

- In thinking skills (98% of students showed increased ability to think creatively, 97% of students showed greater proficiency in thinking critically, and 89% of students yielded better results in systems thinking) (Lieberman and Hoody, 1998).

Environmental education and its relationship with place attachment. Kuru and Palmberg (2000) posed that the more time one spends with the natural world, the more empathy one has toward it. Further, the amount of time spent outdoors has a direct correlation with dedication to environmental stewardship. This dedication often has a direct connection to 'place' – the place where the outdoor interactions are occurring. Encouraging interactions such as environmental education in a specific and special place will contribute to enjoyment of that place and environmentally responsible behavior (Chawla, 1999; Lawrence, 2012).

According to Kobrin and Vaske (2001), place identity is an emotional connection that mentally connects a person to a place. A student making a connection to their schoolyard green space not only bonds the student with their school grounds but to the greater outdoors as well. Caretaking of their immediate living space can lead to greater environmental stewardship application in the larger world.

Chawla (1999) found that, "the special places that stood out in memory, where people formed a first bond with the natural world, was always part of the regular rhythm of daily life," (p 19). When students are regular visitors to their outdoor environmental education school site, giving them direct contact with the natural world and conservation skills, children remember and carry environmental stewardship and enjoyment into perpetuity (Chawla, 1999; Kobrin & Vaske, 2001; Kuru and Palmberg, 2000).

Furthermore, children as outdoor recreators on their school grounds make not only a connection with that place, they make a connection with their fellow students and with themselves (Loeffler, 2004).

Challenges of environmental education. According to Louv (2005), when away from school, children are spending less time outdoors. This addresses the influence of family on children's lives; if family figures don't support appreciative interactions with the natural world and stewardship of natural resources, this further hinders the success of environmental education.

Another challenge is that "main-stream" society continually pushes exploitive (i.e., sports) rather than appreciative (i.e., hiking) outdoor recreational activities (Dunlap and Heffernan, 1975).

Dyment and Reid (2005) contributed that teachers pursuing environmental education must seek institutional support. They also give several reasons why it can be difficult to do so. First of all, teaching and learning through green school grounds is considered by many to be too abstract and difficult to assess. Secondly, teachers are too stifled by stringent centralized standards. Lastly, school policies are too dependent upon the larger school system and cannot act for themselves.

Burriss and Burriss (2011) focused on the amount students get to be outdoors and how that time is structured. This study dealt with 173 school district representatives and asked the general question, 'what is the relationship between your students and their time outdoors'? Only 40% of schools had a written policy regarding outdoor learning and play. Many schools have reduced outdoor time and/or recess time, and some have eliminated it all together. Yet students can benefit from the outdoor environment as a place for learning and engagement.

However, outdoor environmental education is not and cannot be thought of as synonymous with recess or P.E. Though Louv (2005) did pose that unstructured free time outdoors can be beneficial for a child, simply recreating outdoors does not necessarily lead to environmental enjoyment or concern – it takes structured environmental education emphasizing appreciative interactions with the natural world and stewardship of natural resources (Chawla, 1999; Conde and Sanchez, 2010; Dunlap and Heffernan, 1975; Ewert, Place, & Sibthorp, 2005; Lawrence, 2012; Loeffler, 2004; Kuru & Palmberg, 2000; & Tarrant & Green, 1999).

Summary

This chapter has reviewed the literature related to my first research question. This literature review has addressed: environmental education, its structure and function, its relationships with green space and place attachment, and some of its challenges. Intertwined within these categories was environmental education's connection to appreciative interactions with the natural world and its role in stewardship of natural resources. In my next chapter, I will provide a detailed explanation of how my research was conducted.

CHAPTER 3

Methodology

Introduction

In this chapter, I will provide a detailed explanation of how my research was conducted. I will describe the methods I used to gather and analyze my data to answer my research questions. This chapter will discuss the plan of action I chose and the setting in which my research took place. Limitations and threats to internal validity will also be addressed. My research questions are:

1. How will the embedding of a unit on environmental education into a fourth-grade curriculum, in a school encompassing green space, impact the choices student's make, with respect to:
    - Appreciative interactions with the natural world (e.g., observing the behavior of a bird, observing the crystals in a rock)
    - Stewardship of natural resources (e.g., turning off un-needed lights, re-using water bottles)?
2. What will be the impact of developing and teaching a series of environmental education workshops for fourth-grade students on my own professional development as an environmental educator?

Why I Chose the Plan of Action I Propose

Overall research design. "Action research entails studying your own situation to change the quality of processes and results in it" (Schmuck, 2006, pg 28). Not having a class of my own, I utilized an elementary school that was open to an expanded environmental education program.

I was able to bring my skills as an environmental educator into a formal classroom setting. I was further able to work with and learn from four elementary school teachers. I also gained valuable feedback from these teachers that I was able to apply to my teaching. I used action research because it is a valuable way of achieving my goals. Not only did action research assist me in measuring the effectiveness of my intervention but it helped me measure and strengthen my teaching abilities (Hendricks, 2006).

Specific research plan. I specifically used practical classroom action research because of its foundation in research-based practices. Practical classroom action research helped me identify areas of my teaching that need improvement, specifically in reference to curriculum and instruction. Action research allowed me to utilize several kinds of data sources to accurately confront the problem my project is addressing. I used both qualitative and quantitative data in my study. Practical classroom action research is designed with the idea that the teacher, in this case me, is also a researcher. This type of research is focused in on a narrow problem, in my case a lack of environmental education in schools, but has farther reaching long-term applications and results – appreciative interactions with the natural world and stewardship of natural resources. This research type helped me design an action plan for my own educational development and the longevity of the project that I created (Creswell, 2012).

Setting

The setting of my study was "Santa Lucia[1]" Elementary School, in "Toro Peak", California. The following information was taken from websites and school data sheets.

Community. According to the Census Bureau (2013), "Toro Peak" has a population of roughly 34,000 consisting of roughly 50% male 50% female; 65% are between the ages of 18

[1] All proper names related to setting, community, school, participants, etc., are pseudonyms.

and 65, 27% under 18, 8% over 65; 49% are White, 43% are Hispanic/Latino, 9% are Asian, 8% are Black, 7% are Mixed, 2% Hawaiian or Pacific Islander, and 1% American Indian or Alaskan Native. The median household income is about $58,000, with 14% living below the poverty level. The town is set on a northwestern facing hill, sloping toward the "Glassy Sea".

School. "Santa Lucia" Elementary School is one of 12 elementary schools in the district, and serves 536 students in grades K-5. About 85% of students are Hispanic/Latino, 7% are Asian American/Pacific Islander, 3% are African American, and 2% are White. About 74% of students are English Language Learners. About 97% of students fall under the low income family economic category. There are 21 teachers in the school; the majority are of European descent and 20 are female.

Classes. The classes in which the research project was conducted was three fourth-grade classes which with I worked for four weeks in the Spring of 2014.

Participants. The project involved 79 students from three fourth-grade classrooms. One classroom of 26 students was given the post-intervention questionnaire. The breakdown of this convenience sample was as follows: 12 girls, 14 boys, 23 English language learners, 0 special education, age range 9-11, and ethnicity Hispanic and Filipino.

Teachers. This study involved me, one recently retired fourth-grade teacher, and three current fourth-grade teachers. I interacted with all four teachers but only the recently retired teacher helped me design my project and acted as my co-teacher.

- Myself. I am a White male in my mid-thirties. I have been involved with environmental education for well over a decade. I have outdoor environmental education experience at five national parks, most notably the Grand Canyon, where I was a full-time park ranger in education for two years. I am currently involved with environmental education,

working with a non-profit organization directed at school outreach, public outreach, and plant/habitat restoration. I have a bachelor's degree in Natural Resources Planning, Interpretation, and Recreation. I am currently working on a master's degree in education.

- Co-teacher. "Zena" is a recently retired fourth-grade teacher from "Santa Lucia" Elementary School. She has a bachelor's degree in English Literature, a Bilingual Cross-cultural, Language, and Academic Development (BCLAD) state certification, a multi-subject teaching credential, 24 years of teaching experience – mainly at the fourth-grade level. She was also the lead teacher in the school garden and ocean guardian programs.

Data Collection Procedures

Intervention. This project embedded a unit on environmental education into a fourth-grade curriculum. According to Russell (1973), the schoolyard can serve as an outdoor education site. More specifically, students had outdoor learning opportunities at four stations: a plant garden, a vegetable garden, a vermiculture bin, and the school yard. Students rotated through the learning stations during their science periods.

The curriculum for the environmental education unit was based on a unique and detailed framework that was both State Standard-based and in concert with national Common Core Standards. It also was rooted in science but was multi-faceted and applicable to all subject areas. The students kept journals and the assignments recorded in their journals integrated curricular areas. For example, a schoolyard activity addressing science standards was a teacher taking students, equipped with binoculars and a field guide, to identify and explain various members of local flora and fauna, and recording the information in their journal. An example of an outdoor

activity addressing language arts standards was a teacher taking students out to the garden and working on haikus about the natural world (Cutler, 2007).

In this outdoor learning environment, it was hoped that students would enjoy the natural world, learn about eco-literacy, and develop environmental stewardship skills. The bulk of this project was channeled at getting students outdoors in a social, non-competitive, learning environment (Dyment and Bell, 2007).

Teachers utilized my framework, taught students what they needed to be taught, and promoted environmental stewardship in a non-competitive outdoor setting. This connected them to the natural world in a very direct, positive, and personal way at the school and in the classroom.

Implementation.

1. Before the intervention, my research partner and I designed twenty-six environmental education activities for the four learning stations (at least four activities per station). The four learning stations included a native plant garden, an organic vegetable garden, a vermiculture bin, and the school campus itself. We also designed a student journal prompted with the twenty-six activities. One example of a journal activity was writing a haiku or diamante in the and about the native plant garden. Another example of a journal activity was using binoculars and a field guide effectively to identify a bird accurately. We also designed a teacher guide book, which was cross-referenced with the student journal activities, and showed how the activities aligned with State and Common Core Standards. We also designed a post intervention questionnaire for students and teachers.
2. For the next four weeks, I and my research partner worked with all 79 students (three fourth-grade classrooms) at the four learning stations. Students rotated through the

learning stations during their science periods. In the interest of validity and reliability of the project, as well as my overall teaching abilities and effectiveness, I was observed twice by an expert in the field of environmental education. This expert provided me with written feedback. I also maintained a reflective teaching journal.

3. After the four-week environmental education unit ended, one class (the convenience sample) completed the post intervention questionnaire which was distributed and collected within a two-week period. The four teachers also completed a post intervention questionnaire.

Data Collection and Sources

Quantitative data.

- Questionnaires: In order to develop an appropriate questionnaire to elicit tangible responses, I reviewed several published surveys pertaining to environmental education. Specifically, I was inspired by a combination closed-ended, open-ended (Likert style) survey by the Canadian Parks and Wilderness Society and the Sierra Club of Canada that was focused on measuring the success of environmental education programs. This survey aligned closely to what I was trying to measure. For example, their question "I pick up litter when I see it in a park or a natural area" (Thomson, Hoffman, & Staniforth, 2003, pg 60), was adapted to 'It's ok to litter every once in a while, especially if no trash can is close to me'. My 10-item post intervention questionnaire involved eliciting students' perceptions of their appreciative interactions with the natural world and of their stewardship of natural resources. Of the 10 items on the survey, eight were closed-ended, Likert-style questions, asking students to rate their perceptions on a 1-5 scale,

representing "strongly agree" to "strongly disagree". Content face validity was assessed by having the survey reviewed by an expert in children's environmental education.

Qualitative data.

- Questionnaires: The 10-item survey also included two open-ended questions. These questions elicited student's perceptions of their appreciative interactions with the natural world and their stewardship of natural resources and allowed them to express more open and lengthy responses. The teacher post intervention questionnaire consisted of four open-ended questions; two questions addressed student's appreciative interactions with the natural world and stewardship of natural resources, and two questions addressed the integrity and effectiveness of the project itself. The environmental education professional's open-ended questionnaire addressed the integrity and effectiveness of my teaching and the project itself.
- Descriptive narratives: I kept a reflective teaching journal. This journal recorded my: Observations of students' social and academic dynamics in this outdoor learning environment, observations of students' increase/decrease in appreciative interactions with the natural world and stewardship of natural resources, reflections on my own professional development as an environmental educator.

Data collectors. All data collection will be done by me.

Data Analysis

Quantitative data.

- Questionnaires: In action research, survey data are analyzed using bar graphs rather than inferential statistics (Hendricks, 2006; McMillan & Schumacher, 2010). Specifically,

responses for each closed-ended item on the student post intervention questionnaire were tabulated in a frequency table and also bar-graphed to facilitate analysis.

Qualitative data.

- All documents, including the open-ended questionnaire items and my reflective teaching journal, were analyzed by searching for topics, patterns, and themes. Results of both the quantitative and qualitative data were applied to answer my research questions.

Limitations and Threats to Internal Validity

- Implementation fidelity: I essentially created this project from the beginning, based upon professional experiences and observations. Therefore, it is possible that this project was not implemented as fully or as adequately as would have been liked. I tried to minimize this threat by having an expert in the field of environmental education observe my teaching once every other week, during the project study, to provide me with feedback and suggestions.
- Experimenter bias: The fact that I was both researcher and data collector/analyst may have biased both roles. To minimize bias, all questionnaires remained nameless.
- Project duration concerns: The one-month project duration may have been insufficient time to yield data that definitively answered the research questions. However, a short project duration reduces the probability of other internal validity threats such as student maturation and differential loss.

Summary

In this chapter, I have provided a detailed explanation of how my research was conducted. I have described the methods I used to gather and analyze my data to answer my research questions. Practical classroom action research was the research method I chose because

of its applications to my current teaching situation. I was able to analyze my teaching and focus in on student learning. I consistently utilized the action research process modeled by Hendricks (2006) of reflect-act-evaluate. This type of research has far-reaching long-term impacts and assisted me with formulating an action plan. In my next chapter, I will discuss the findings of my study.

CHAPTER 4

Findings

Introduction

In this chapter, I will discuss the findings of my study. I collected qualitative data by using my: student written open-ended post survey answers, teacher written open-ended post survey answers, an environmental education professional's written open-ended survey answers, and my own reflective teaching journal. I collected quantitative data by using my student written closed-ended (Likert style) post survey answers. This data was analyzed by searching for topics, patterns, and themes. I utilized this data to answer my research questions. My research questions are:

1. How will the embedding of a unit on environmental education into a fourth-grade curriculum, in a school encompassing green space, impact the choices student's make, with respect to:
    - Appreciative interactions with the natural world (e.g., observing the behavior of a bird, observing the crystals in a rock)
    - Stewardship of natural resources (e.g., turning off un-needed lights, re-using water bottles)?
2. What will be the impact of developing and teaching a series of environmental education workshops for fourth-grade students on my own professional development as an environmental educator?

Student Written Open-ended Post Survey Answers

Students were given two open-ended questions on a post survey. The first question addressed appreciative interactions with the natural world and the second question addressed stewardship of natural resources. The first question was: When you see something like a pretty leaf on a tree or a bird in the field, do you ever stop whatever else you are doing just to enjoy looking at it? Describe one of those times.

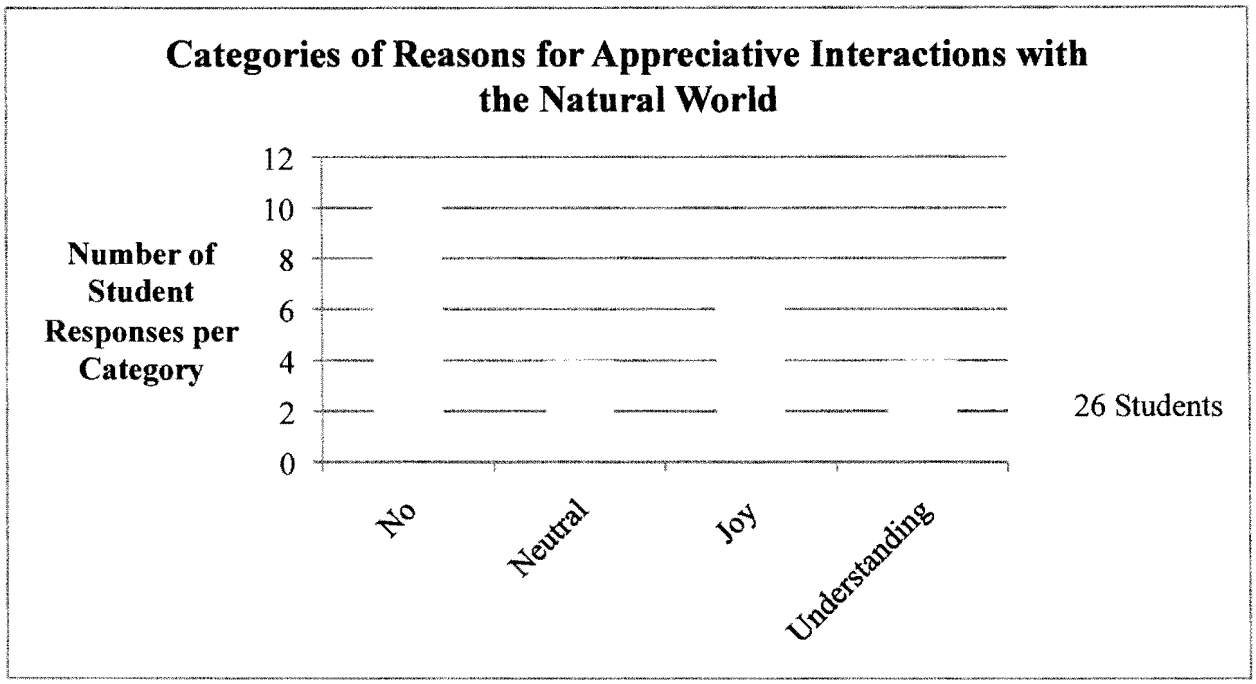

Figure 1. Categories of reasons for appreciative interactions with the natural world.

I found that students' answers fit into one of four categories: 'No', 'Neutral', 'Joy', and 'Understanding'. The highest category in figure 1 was 'No' – students that do not participate in appreciative interactions. An example of a student's response in this category was, "I don't do that[.]" An example of a 'Neutral' response would be, "last time, [referring to the last time this student was part of my project,] I stopped and looked at a rock and saw it." The category that was most intimately associated with my research questions was 'Joy'. Two examples of students responding to engaging in appreciative interactions as a source of joy would be: (1) "One day I

saw a bird that was so interesting. It had red, and orange wings. It's nest was built of woods when I saw it. Then I took a picture of it so I could remember of it." And (2) "I saw a rock in my patio it was with a pattern of pear[l] white and black stripes so I put it with the rest of my rock collection!" The final category in figure one was 'Understanding'. An example of a student engaging in an appreciative interaction to gain understanding would be, "One time I saw a Per[e]grine Falcon and stopped to check its movement."

The second question was: "Do you think it is important to protect and conserve the natural world? Why or why not?

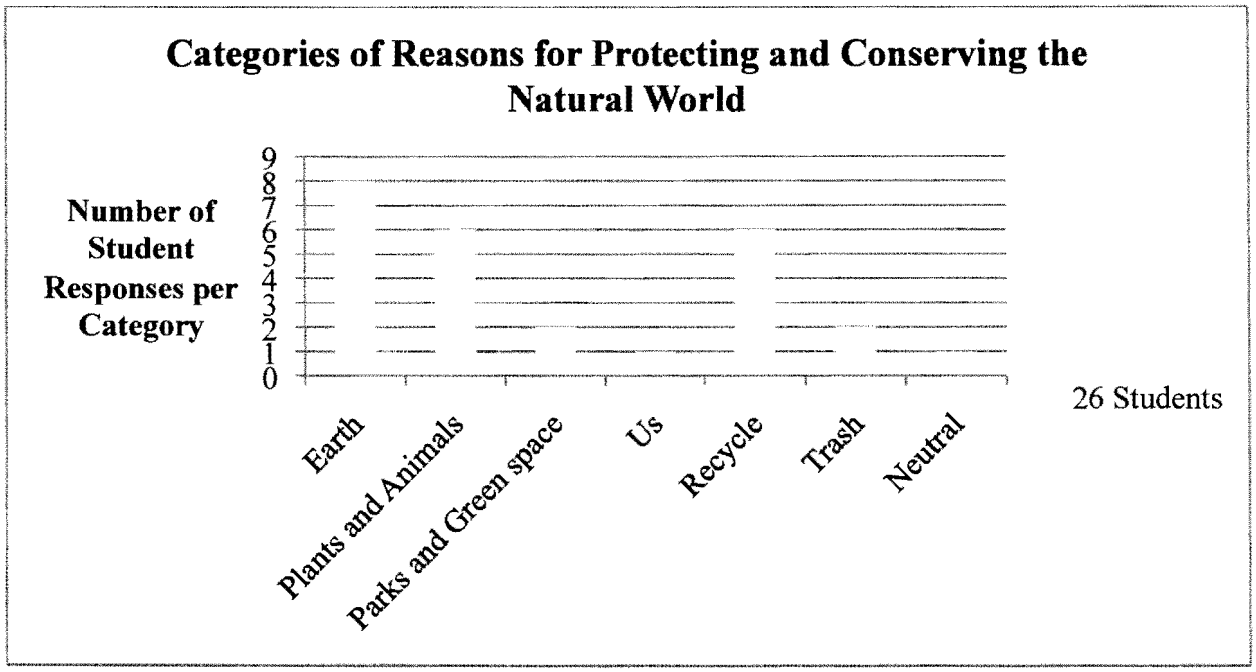

Figure 2. Categories of reasons for protecting and conserving the natural world.

Out of twenty-six students, twenty-five stated that they support stewardship of natural resources; the one student who didn't say 'yes', didn't say 'no', their answer was simply ambiguous. I found that students' answers fit into one of seven categories: 'Earth', 'Plants and Animals', 'Parks and Green space', 'Us', 'Recycle', 'Trash', and 'Neutral'. The highest category in figure 2 was 'Earth'. Although this is a very inclusive and ecology-minded response, it is also

vague. Many students responded with this exact phrase, "to help the earth[,]" or with variations such as "to help our earth[,]" or "[to] protect our world." Several students responded with variations of, "to help plants and animals[,]" or, "to help the animals[,]" or, "we need trees to breathe and plants to live." The responses of this category, 'Plants and Animals', were more biology-minded and specific. The category 'Parks and Green space' consists of responses alluding to natural areas on public lands and on school campuses. Both students in this category responded, "we need green space, so must conserve." The category 'Us', consisted of one student who answered with a humanistic and utilitarian response of, "because we live on Earth, and get our supplies from rivers and we enjoy Exploring forests and The [A]frican safari." There are allusions to conservation and protection here, as well as recreation and consumption. The category 'Neutral', consisted of one student who responded, "less water less fossil fuels less cans less trash[.]" Six students made reference to recycling being related to stewardship of natural resources. For example, one student responded, "because, we could recycle." Another student responded, "because you have to recycle[.]" Indeed, this category, 'Recycle', was tied with 'Plants and Animals', as the second highest category. The final category was 'Trash'. One student responded, "you can not put trash in the water[.]" Another student responded, "if you don't throw trash away, Earth is going to become real dirty[.]"

Figures 1 and 2 display categories of reasons why my study-group students take part in appreciative interactions with the natural world and stewardship of natural resources. It is challenging to know how directly related or impacted by my study their answers were. However, some answers did allude directly to their experiences during my project. For example, in relation to the campus field trip, where students were given binoculars and bird field guides, one student responded to question one with, "I a[d]mired a bird and it was blue. And it would flap it's

wing[s] fast." Another example of a student's response that could be connected to my project was, "we need green space, so must conserve." Both the terms "green space" and "conserve" bear direct connection to my project for two reasons: (1) I used those terms from time to time as part of my teaching curriculum, and (2) teachers would sometimes integrate my curriculum with theirs, as I would integrate theirs with mine.

Teacher Written Open-ended Post Survey Answers

The three teachers involved in this study, as well as my co-teacher, were given a four-question written open-ended post survey. Two questions addressed students' appreciative interactions with the natural world and stewardship of natural resources; and two questions addressed the environmental education science unit project itself. One teacher and my co-teacher completed and returned the survey.

The first question was: Are your students more likely to engage in appreciative interactions with the natural world (e.g., observing and enjoying a bird in the field, observing and enjoying crystals in a rock)? Explain.

Both teachers responded yes, to this question. One teacher responded, "Students continued to observe and interact with the [natural] environment beyond the outdoor classroom time." The other teacher responded, "[My] students are more likely to engage with the natural world." And further, "I have heard my students commenting on the different types of birds since they used the binoculars."

The second question on the survey was: Are your students more likely to engage in stewardship of natural resources (e.g., turning off unneeded lights, turning off excess water)? Explain.

One teacher answered no, to this question. She responded, "I have not noticed greater stewardship of natural resources as a result of this project." The other teacher responded, "This is ongoing education. As students continue to participate in lessons and activities toward this stewardship goal, it will become a 'solid' part of their lives".

The third question on the survey was: What did you find to be strengths of the program?

One teacher responded, "small groups, standards-based activities with choices of activities at each site, teacher guide, student journal, goals." The other teacher responded, "getting students outside, learning and engaging in an outdoor setting… This made a greater impact on the students."

The fourth and final question on the survey was: What did you find to be weaknesses of the program?

One teacher responded, "… the [student] post survey. Many of my students were confused by the language and confused by the Likert scale." The other teacher responded, "More time needed for instruction; helpful to know teachers' chosen site ahead of time; teachers [should] go through goals first [and make] preparation before outdoor class."

Environmental Education Professional's Written Open-ended Survey Answers

In order to enhance the validity of my study, an environmental education professional observed and critiqued my performance as an environmental educator and my overall project.

Strengths. In reference to me as an environmental educator, the environmental education professional stated that I was: 'competent,' 'respectful,' 'fair,' 'playful,' 'kind,' 'encouraging,' 'supportive,' 'animated,' and 'patient.' I also "set a good tone in the classroom of what was expected for the outdoor learning." In reference to my project, the environmental education professional stated that: students "were on task and involved", "stations were very appropriate to

the age and ability level of the students. They had good materials and supplies," and the student "journals were cool."

Further, "this type of shared lessons may be a super way of doing science-based professional development for teachers because they have time to practice with small groups."

Areas for improvement. The environmental education professional gave me three key insights: (1) "If a student is struggling, ask a neighboring student to help;" (2) "Spend more time training students how to use the [tools and supplies (e.g., binoculars and hand lenses)];" and (3) "Each box of supplies should have a small white board included [to spell out words, draw diagrams and cycles, etc.]."

Reflective Teaching Journal

Throughout the course of my project, I kept a daily reflective teaching journal. My journal yielded many findings which will be addressed in four sections: positive experience, classroom management, structure, and logistics.

Positive experience. Most students were excited to see us for their science period. Once, upon entry into the classroom, I heard a student exclaim, "I love science now!" Once, upon leaving the office, a student greeted me and said, "I can't wait 'til Tuesday," – the next time he had science period with me and my co-teacher. Although I cannot ascertain if there were any students who did not wish to be a part of my project, the overall sense was that it was a positive experience for the children.

Classroom management. As an environmental educator, I usually have the privilege of working with smaller groups than a formal classroom educator. However, I lack the authority of the formal classroom educator, therefore students may be more inclined to misbehave or be disruptive. Moreover, I am not a natural disciplinarian; it is more my nature to 'play' with the

kids than formally educate them. This project further reminded me to always have discipline in mind, not hidden in the back of your mind; and keep joviality and playfulness in check at all times.

Structure. It was beneficial if not necessary to have an introduction at the start of each science period. This introduction included ground rules, goals, etc. It was also a time to touch-base with the teacher. Before my project and/or throughout my project, it would have been advantageous to be on-the-same-page as the teacher in terms of curriculum, content, vocabulary, goals, etc. This relationship between the environmental educator and formal classroom teacher is more conducive to teaching and learning. For example, I incorporated Venn diagrams into my lessons because the students were familiar with them. Further, I made it a habit of calling our outdoor education areas 'outdoor classrooms' to help distinguish our time from recess and physical education. At least one other teacher incorporated that term into her teaching.

Logistics. It is crucial to know the supplies you need and have them available. One supply that I wish I would have had present in my project was something like a small white board in each box at each station. This board would have served as a visual aid for diagrams, cycles, spelling etc. Moreover, pictures of complex ideas would have been extremely helpful. For example, showing a picture of an igneous rock cooling from lava or magma would have been conducive to teaching and learning. Finally, it is wise to collect supplies before the students leave, so no supplies are lost.

Student Written Closed-ended (Likert style) Post Survey Answers

Students were given eight questions related to appreciative interactions with the natural world and stewardship of natural resources. The questions were:

1. All schools should have green space (natural areas)?

2. People should all make a strong effort to conserve natural resources?
3. Farmers and gardeners should use organic natural materials to maintain and protect crops, rather than synthetic or chemical materials; even if synthetic or chemical materials make them more money?
4. I enjoy picking up and really looking at certain rocks?
5. It's okay to litter every once in a while especially if no trash can is close to me?
6. I would be willing to work to help the natural environment by planting new plants, or cleaning up an area, even if it takes away from my free time?
7. I always try to compost?
8. I always try to reduce-reuse-recycle?

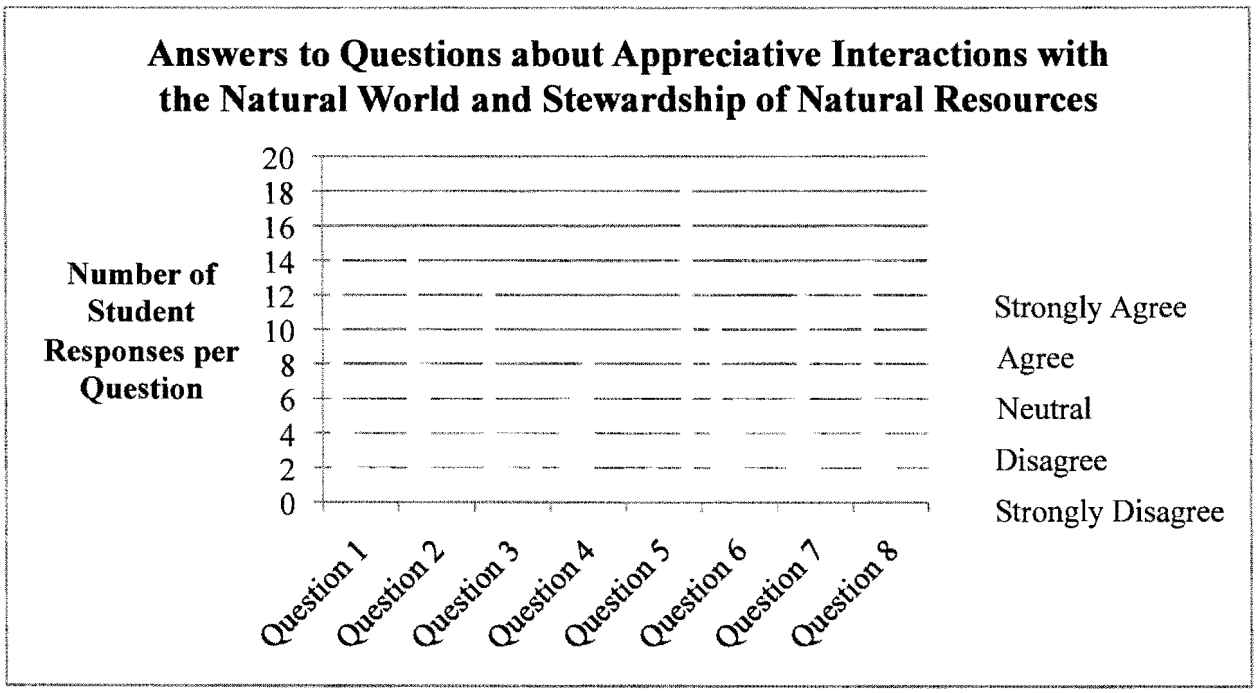

Figure 3. Answers to questions about appreciative interactions with the natural world and stewardship of natural resources.

Questions 1-3 had to do with *societal* appreciative or stewardship ideals. For example, 'People should all make a strong effort to conserve natural resources (question 2).' I found that

the vast majority of students support the ideal that other people in society, in addition to themselves, should take an active role in enjoying, conserving, and protecting the natural world.

Question 4 was the only question on my survey that had to do with *personal* appreciative interactions with the natural world. The question was, 'I enjoy picking up and really looking at certain rocks.' I found that the majority of students were neutral to this concept. However, the figure also shows that students lean to the positive agree-side of the spectrum rather than to the negative disagree-side of the spectrum.

Questions 5-8 had to do with *personal* environmental stewardship practices. Question 5 is unique to the survey in that the desired response to, 'It's ok to litter…,' is 'Strongly Disagree', whereas all other questions on the survey, such as 'I always try to reduce-reuse-recycle (Question 8)' had 'Strongly Agree' as the desired response. I found that for the most part, students agree with taking a personal active role in environmental stewardship practices.

Summary

In this chapter, I discussed the findings of my study. I collected both qualitative and quantitative data by using open-ended and closed-ended surveys, and a reflective teaching journal. This data was analyzed by searching for topics, patterns, and themes. In the next chapter, I will discuss my findings, apply them to the larger scope of environmental education, and create an action plan.

CHAPTER 5

Discussion and Action Plan

Introduction

In this chapter, I will discuss the findings of my study as they apply to my project overview, literature review, implications, recommendations, and action plan. In this chapter I will also indicate how my research questions were answered and what that portends for future exploration in regards to environmental education at the elementary school level. My research questions are as follows:

1. How will the embedding of a unit on environmental education into a fourth-grade curriculum, in a school encompassing green space, impact the choices student's make, with respect to:
    - Appreciative interactions with the natural world (e.g., observing the behavior of a bird, observing the crystals in a rock)
    - Stewardship of natural resources (e.g., turning off un-needed lights, re-using water bottles)?
2. What will be the impact of developing and teaching a series of environmental education workshops for fourth-grade students on my own professional development as an environmental educator?

Discussion

Environmental education inspires children to more greatly appreciate and enjoy the natural world. Unfortunately, environmental education is not embedded in most school's curriculum and cash strapped school districts have allocated minimal funds to support

environmental education. This contributes to children growing up more and more disconnected to and separate from the natural world (Louv, 2008). According to (Dyment and Bell, 2007; Dyment and Reid, 2005), the loss of the natural world in our children's lives is unhealthy for our children physically, mentally, emotionally, and spiritually. Along with lack of funding for environmental education, there has been a paradigm shift with a focus on high-stakes tests. This reduces educational opportunities for students and relegates teachers and students to highly scripted reading and math programs.

This study was one month long and embedded a unit on environmental education into an elementary school curriculum. The central goal of the study was to determine if embedding environmental education into school curriculum inspires children to more greatly appreciate and enjoy the natural world. In this study, appreciation and enjoyment was measured through appreciative interactions with the natural world and stewardship of natural resources.

This project was conducted with fourth-grade students, with the central focus of getting students outdoors in a social, non-competitive, learning environment (Dyment and Bell, 2007). More specifically, students had outdoor learning activities and opportunities at four stations: a plant garden, a vegetable garden, a vermiculture bin, and the school yard. The curriculum complied with state and common core standards. The curriculum was also rooted in science yet several sections were applicable to other subject areas (Cutler, 2011). Students were given a journal that integrated curriculum and teachers had a teaching guide that aligned with the student journal.

There are three areas within my student and teacher written open-ended post survey answers that warrant discussion: (1) why did the majority of students not (want to) engage in appreciative interactions, (2) why was there a disconnection between thought and action for

some stewardship practices, and (3) why was environmental stewardship not stressed more in my study.

Student written open-ended post survey answers. The open-ended questions addressed appreciative interactions with the natural world and stewardship of natural resources. I was disappointed to see that the majority of students did not (want to) have appreciative interactions. Indeed, inspiring these interactions was at the heart of my study. However, I think the reason why so many students didn't (want to) make the heart-felt connection to the natural world was because their cognitive and affective development was not at a maturation level wherein they could make the connections. It must be noted that in the field of environmental education all one can do is *expose* children to natural settings, while *planting* seeds of appreciation and stewardship, and *hope* the seeds blossom and fruit. My project provided opportunities for students to engage with natural settings and planted seeds of appreciation and stewardship.

Further, out of the twenty-six students, twenty-five stated that they support stewardship of natural resources; the one student who didn't say 'yes', didn't say 'no', their answer was simply ambivalent. This result was very positive supporting the position that elementary school students are being introduced to the concepts and practices of environmental stewardship. However, there is often a discrepancy between what takes place in regards to one's thought about environmental issues and the action. For example, throughout this project and my current position in environmental education, myself and other educators continually encourage students to recycle and not litter, yet I continually observed the same students litter and not recycle. I think here too, maturity is a key factor. It is hoped that through efforts identified in this research and as students mature there will be a connection will between one's choices and the consequences in relation to the natural world.

Teacher Written Open-ended Post Survey Answers. The two teachers who responded to the surveys indicated that their students were less likely to engage in stewardship of natural resources but more likely to engage in appreciative interactions with the natural world. Interestingly enough, the student responses suggested that they were more likely to engage in stewardship but less likely to engage in appreciative interactions. It is clear that the current study did not stress environmental stewardship, although that was one of my goals in relation to my first research question. Most of my environmental stewardship curriculum was centered around indoor components (i.e., turning off water, turning off unneeded lights) and the organic vegetable garden. Since my curricular activities took place outdoors, it was difficult to address the indoor components. Since it was not the season for much plant activity in the vegetable garden, the vegetable garden was not a popular site for the environmental education. Therefore, environmental stewardship was not stressed.

Connections to literature review. Embedding environmental education into a school curriculum has several challenges; these include lack of school funding, lack of time, lack of interest, stringent standards, and campus design (Dyment and Reid, 2005). My study was influenced by all of these factors. Thankfully, the principal and teachers allowed me to utilize the student's science periods and school grounds for one month.

The campus green school ground design was conducive to my project and student's benefited from four pre-existing learning and activity areas – the campus green space itself, the vermiculture bins, the organic vegetable garden, and the native dune plant garden. This design and my project aided in less gender and geographic isolation. Although competitive traits and desires crept in (i.e., who could finish the plant scavenger hunt first), at least it was boys and girls working together (Dyment and Bell, 2007; Evans, 2001). Part of the reason students are

conditioned to compete is because, according to Dunlap and Heffernan (1975) and Ewert, Place, and Sibthorp (2005), "mainstream" society continually pushes exploitive (i.e., sports) rather than appreciative (i.e., hiking) outdoor recreational activities. I did my best to snuff out competition and want to believe my project aided in greater student harmony. I also observed three students who were actively engaged in all activities and even helped me throughout my project. It is feasible these students exemplified a naturalistic intelligence; they were highly observant, more passive, and of a more nurturing nature (Gardner, 1999).

As a researcher, I noticed that at the organic vegetable garden and vermiculture sites – the students really wanted to be involved in the maintenance of those sites (perhaps even more than they wanted to be a part of the educational activities). I think this is partly because they were taking an active role in maintaining those sites and this created a deeper emotional attachment. This emotional place attachment connected students to their school and aided in cementing appreciative interactions with the natural world and stewardship of natural resources (Chawla, 1999; Kobrin and Vaske, 2001; Lawrence, 2012). Once, when two students and I overturned a bail of hay, we found a fair amount of spiders. I was sincerely impressed with how calm and respectful these students were. I believe the context of my environmental education influenced the gentleness toward these animals.

It is difficult to maintain an engaging outdoor environmental experience for students and to analyze if indeed it influences student enjoyment of the natural environment as well as conservation. If anything, my outdoor environmental activities simply exposed children to the natural world. This was one of my project goals, although not directly related to my research questions, and may contribute to appreciation and stewardship (Chawla, 1999; Tarrant and Green, 1999).

Much of the current literature agrees that stewardship of natural resources should be the primary goal of environmental education (Conde and Sanchez, 2010; Hawken, 2007; Kuru and Palmberg, 2000). I am not disagreeing with this but I believe that environmental education needs to be more involved in inspiring joy and wonder between students and the natural world. It is my hope that this connection and appreciation for the natural environment will then be a bridge to environmental stewardship.

Before the start of each of our outdoor experiences, my co-teacher and I stressed to the students that the environmental education experience was taking place in an *outdoor classroom* for enjoyment, learning, and skill building. Outdoor environmental education is not and cannot be thought of as synonymous with recess or P.E. Though Louv (2005) did pose that unstructured free time outdoors can be beneficial for a child, simply recreating outdoors does not necessarily lead to environmental enjoyment or concern – it takes structured environmental education emphasizing appreciative interactions with the natural world and stewardship of natural resources (Chawla, 1999; Conde and Sanchez, 2010; Dunlap and Heffernan, 1975; Ewert, Place, & Sibthorp, 2005; Lawrence, 2012; Loeffler, 2004; Kuru & Palmberg, 2000; & Tarrant & Green, 1999).

Implications. Environmental education can take on several different designs with different goals. Much environmental education takes place far from any formal classroom atmosphere. Most children go to school; a much smaller percentage of children recreate with their families to distant places where environmental education may occur, such as parks and nature centers. Therefore, environmental educators can reach more children through the formal school system. Many school administrations encourage environmental education to be present in curriculum and many teachers impart environmental education to their students. However there

is a vast array of students who do not get trained in the skills of environmental stewardship or get encouraged to enjoy the natural world through appreciative interactions with it. My project was designed specifically for a formal classroom atmosphere. The intent of my research was for elementary schools to consider including aspects of environmental education in the school curriculum. Embedding environmental education into school curriculum could potentially lead to greater respect and protection of our earth. Students can also learn how to enjoy the natural world as a source of joy, wonder, peace, and understanding which in turn enhances awareness of the potential exploitation of the earth's precious resources.

Recommendations. If anyone was going to design a similar project as the one I undertook, a few recommendations are worth noting:

- Assure adequate time with the students. The time periods I was allotted were the science periods, which were 25 minutes in length. When taking into consideration opening dialogue, travel, explanations, tool use, concluding dialogue, etc., this was not enough time to facilitate learning.
- Know which sites you and the teachers are going to ahead of time. My co-teacher suggested creating a spreadsheet ahead of time so educators know where the experience takes place well in advance. This will aid in fluidity and teacher prep.
- Encourage teacher involvement, preparation, and follow-up. If students are more in tune with the learning experience, this will aid in fluidity and student learning. If teachers integrate your project more into their rubrics and lesson plans, the students will have more time with your material and this will greatly benefit your project teaching/learning goals.

- Align with the teachers. If you use similar terminology and tools that the teachers use, this will aid in student learning and put you on higher ground with the teachers. Further, if teachers align with you, their environmental education will be enhanced.
- Decide if it is better to do one activity thoroughly across several sessions or one activity per session that may not have the breadth or involvement as the more thorough activity.
- Have something like a small white board to attach visuals to and show cycles, diagrams, etc.
- Encourage critical thinking and the use of tools. Make sure they know the difference between a tool and a toy, rough drafts and final drafts, etc.
- Be aware that explaining how to use the tools and supplies is time consuming but if they don't know how to use them effectively, your project and the students won't benefit from them.
- Know how to address distractions. Choose if you are going to absorb the distraction or remove it. Once again, time is an issue, the amount of time you have will heavily influence this decision.
- Be aware that different activities have different effects and produce different results with different students. My experience with the haiku did not go well the first time and unfortunately I didn't have the time to try it several times. Know your timeframe, your students, and how to do the activity well.

Action Plan

My action plan stems mainly from my first research question, which deals with embedding environmental education into an elementary school curriculum, with the hopes of

increasing student's enjoyment and stewardship of the natural environment. The three areas of my action plan I am going to discuss are (1) goals, (2) implementation, and (3) barriers.

Goals. Ideally, environmental education would be embedded in all school curriculum. However, within the realm of my limited influence, I would like to see my project spread to the third and fifth-grade classrooms. The rest of the elementary school could benefit from the project as well but additional activities aligned with common core and state curriculum standards would need to be created; I stress the use of the Next Generation Science Standards as a guide. I am confident that the activities I have designed are appropriate for a third to fifth-grade level, with little design change. Students would have hands-on, engaging activities that promote appreciation of the natural world and environmental stewardship. These activities would take place in the four settings I utilized and would happen in outdoor, socially harmonious environments (i.e., void of competition).

Implementation. The experienced fourth-grade teachers could act as role models for other teachers if they would like. It will also be useful for involved teachers to utilize the teacher guide me and my co-teacher created. The teacher guide is aligned with a student journal me and my co-teacher designed; use of such a journal is up to the involved teachers. Teacher training is basic and builds upon preexisting teacher knowledge, skills, and abilities. Before the project, teachers will be introduced to environmental education, through the lens of the project, with direct reference to:

- Outdoor environmental education
- Appreciative interactions with the natural world
- Stewardship of natural resources
- Grade specific Next Generation Science Standards

Barriers. The major barriers anticipated prior to and during plan implementation include teacher hesitation and resource availability.

Teacher hesitation. The three fourth-grade teachers were supportive of my project but they made it clear that they were limited on time. The continued success of the project's legacy is contingent upon several factors, one of which is the time (e.g., matching standards to activities, walking to and from activity sites). It is very difficult to address a barrier such as time. Teachers must have (or make) the time to embed environmental education into their curriculum. Another factor that influences the continued success of the project is desire; if teachers don't want to put energy toward the outdoor environmental education, it will not succeed. Hopefully, the fluidity of the project will be so maximized as to assist the teachers in the project's continued success. Perhaps a flow or a pattern will be reached during the study which will further streamline the process.

Resource availability. My project took place at four outdoor learning stations. Each of these stations require resources, much of which me and my co-teacher provided for future use (e.g., binoculars, field guides). The vermiculture bins, organic vegetable garden, and native dune plant garden are considered part of the school's normal responsibilities to maintain and/or operate. Therefore, utilizing those three stations should not require any additional resources. The fourth station consists of utilizing the campus itself for a field trip. The campus and its resources is/are always available for the teachers to use, so this station should not pose too many additional challenges either.

Conclusion

In the beginning, I set out to see if embedding a unit on environmental education into a fourth-grade curriculum would enhance student enjoyment and conservation of the natural world.

My findings indicate that the students I had the privilege to work with have not had any epiphanies or undergone any dramatic lifestyle changes but I believe my project was successful. My study was a small piece of a much larger tapestry of environmental education. For 30 minutes of one of their class days, students were outside in safe harmonic environments, being nurtured with appreciative interactions and stewardship of the natural world. It is difficult to measure the full positive impact of my study but I believe, be it ever so slight, there was one.

The second piece of my study dealt with my own professional development as an environmental educator. I am a little bit better of an environmental educator as a result of this study. Indeed, experience in a formal classroom atmosphere was highly beneficial. To some extent, I believe that the rural outdoor educator should have exposure to the formal classroom environment, and the structured indoor educator who wants to embrace environmental education should have exposure to the informal outdoor classroom. An environmental educator can be thought of as a naturalist who educates. Naturalists deal much with passion and emotion – we are trying to protect what we love – the natural world. Educators deal much with structure and result – we are trying to teach who we love – the student. Our careers are windy roads built upon hills of experience. Projects such as mine are small ways of reaching out to the world, for the sake of the earth.

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Appendices

Appendix A

Student Written Open-ended Post Survey

1). When you see something like a pretty leaf on a tree or a bird in the field, do you ever stop whatever else you are doing just to enjoy looking at it? Describe one of those times.

2). Do you think it is important to protect and conserve the natural world? Why or why not?

Appendix B

Student Written Closed-ended (Likert style) Post Survey

All schools should have green space (natural areas).

Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree

People should all make a strong effort to conserve natural resources.

Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree

Farmers and gardeners should use organic natural materials to maintain and protect crops, rather than synthetic or chemical materials; even if synthetic or chemical materials make them more money.

Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree

I enjoy picking up and really looking at certain rocks.

Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree

It's okay to litter every once in a while especially if no trash can is close to me.

Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree

I would be willing to work to help the natural environment by planting new plants, or cleaning up an area, even if it takes away from my free time.

Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree

I always try to compost.

Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree

I always try to reduce-reuse-recycle.

Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree

Appendix C

Teacher Written Open-ended Post Survey

1). Are your students more likely to engage in appreciative interactions with the natural world (e.g., observing and enjoying a bird in the field, observing and enjoying crystals in a rock)? Explain.

2). Are your students more likely to engage in stewardship of natural resources (e.g., turn off unneeded lights, turn off excess water)? Explain.

3). What did you find to be strengths of the program?

4). What did you find to be weaknesses of the program?

Appendix D

Environmental Education Professional's Written Open-ended Survey

1). Comment upon my professional knowledge, skills, and abilities as an environmental educator.

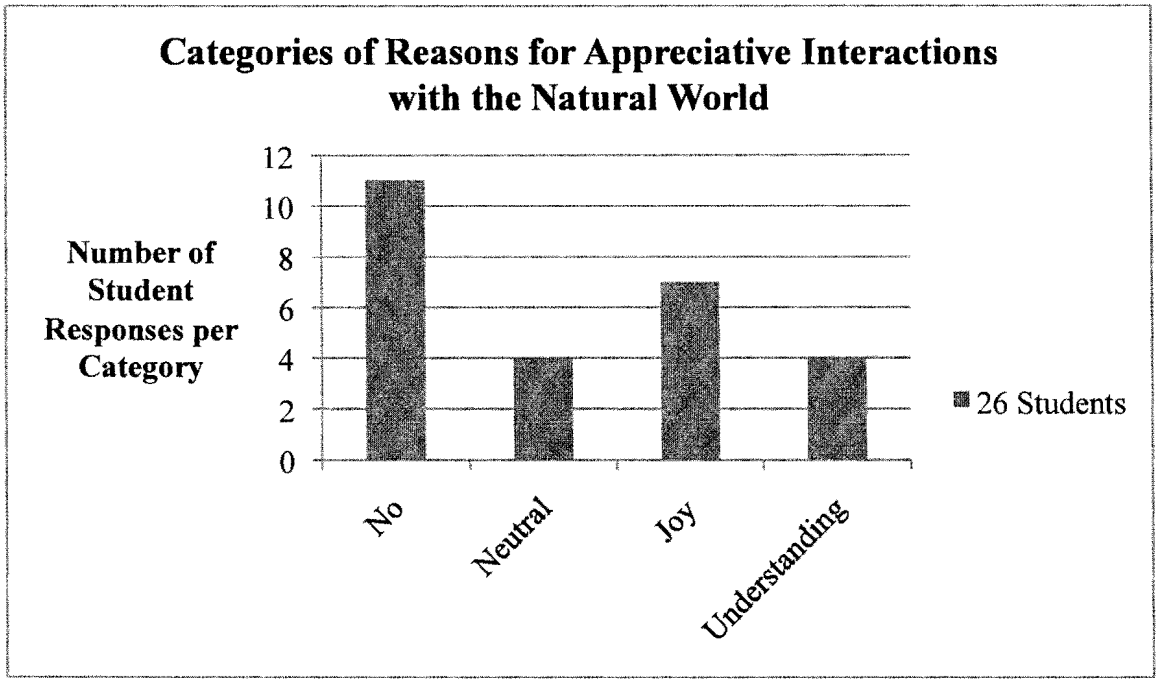
2.) How was my rapport with the students (i.e., my competence, joviality, discipline, etc.)?

3.) What did you think of the project itself (i.e., the environmental education unit, the four stations, etc.)?

4.) Comment on anything else you would like, in regards to me and this project.

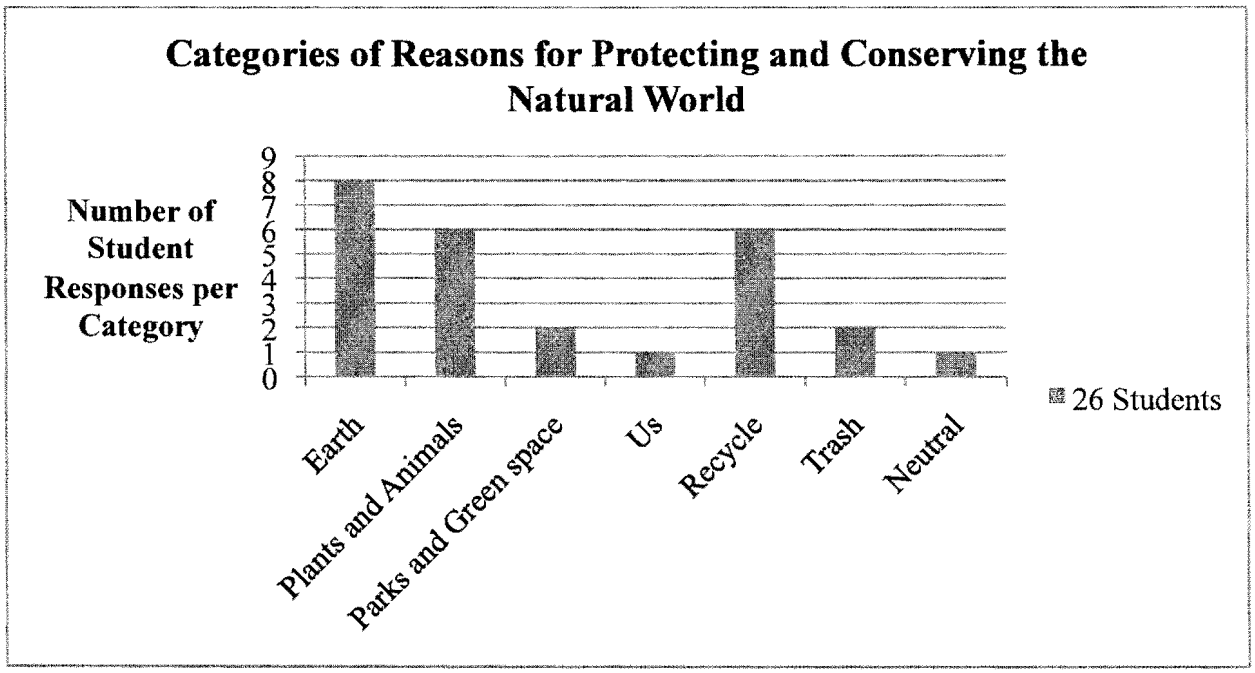
Appendix E

Figure 1



Appendix F

Figure 2



Appendix G

Figure 3